Geophysical Research Abstracts
Vol. 16, EGU2014-4819, 2014
EGU General Assembly 2014

Probabilistic postprocessing models for flow forecasts for a system of catchments and several lead times

Kolbjorn Engeland (1) and Ingelin Steinsland (2)
(1) NVE, Oslo, Norway, (2) Department of Mathematical Sciences, NTNU, Trondheim, Norway

This study introduces a methodology for the construction of probabilistic inflow forecasts for multiple catchments and lead times, and investigates criterions for evaluation of multi-variate forecasts. A post-processing approach is used, and a Gaussian model is applied for transformed variables. The post processing model has two main components, the mean model and the dependency model. The mean model is used to estimate the marginal distributions for forecasted inflow for each catchment and lead time, whereas the dependency models was used to estimate the full multivariate distribution of forecasts, i.e. co-variances between catchments and lead times. In operational situations, it is a straightforward task to use the models to sample inflow ensembles which inherit the dependencies between catchments and lead times. The methodology was tested and demonstrated in the river systems linked to the Ulla-Førre hydropower complex in southern Norway, where simultaneous probabilistic forecasts for five catchments and ten lead times were constructed. The methodology exhibits sufficient flexibility to utilize deterministic flow forecasts from a numerical hydrological model as well as statistical forecasts such as persistent forecasts and sliding window climatology forecasts. It also deals with variation in the relative weights of these forecasts with both catchment and lead time. When evaluating predictive performance in original space using cross validation, the case study found that it is important to include the persistent forecast for the initial lead times and the hydrological forecast for medium-term lead times. Sliding window climatology forecasts become more important for the latest lead times. Furthermore, operationally important features in this case study such as heteroscedasticity, lead time varying between lead time dependency and lead time varying between catchment dependency are captured. Two criterions were used for evaluating the added value of the dependency model. The first one was the Energy score (ES) that is a multi-dimensional generalization of continuous rank probability score (CRPS). ES was calculated for all lead-times and catchments together, for each catchment across all lead times and for each lead time across all catchments. The second criterion was to use CRPS for forecasted inflows accumulated over several lead times and catchments. The results showed that ES was not very sensitive to correct covariance structure, whereas CRPS for accumulated flows where more suitable for evaluating the dependency model. This indicates that it is more appropriate to evaluate relevant univariate variables that depends on the dependency structure then to evaluate the multivariate forecast directly.